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The Agricultural College

EXTENSION BULLETIN

Vol. VII. APRIL, 1912. No. 8

TRANSPLANTING

By VERNON H. DAVIS
Assistant Professor of Horticulture

"The out-of-door boy is the fellow for me.
He betters his pastimes whatever they be;
May he grow in his numbers till every boy
Is an out-or door scholar, partaking its joy."

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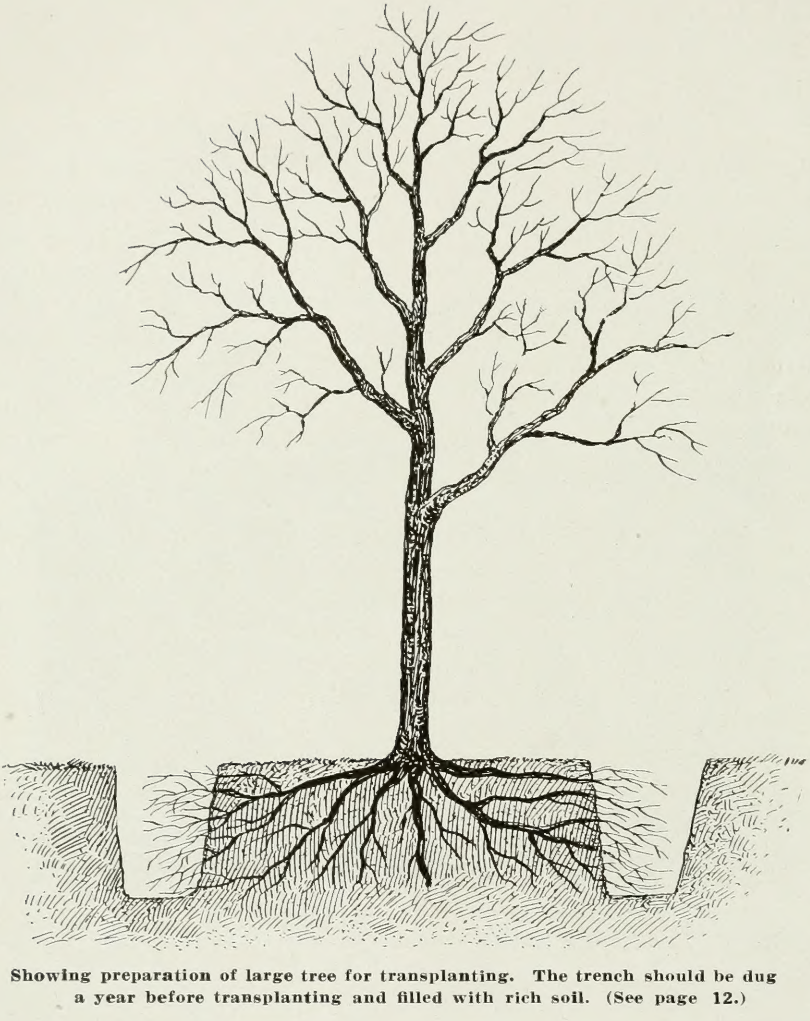
PUBLISHED MONTHLY BY THE OHIO STATE UNIVERSITY
COLUMBUS

Entered as Second Class Matter, November 17, 1905, at the Post Office at Columbus, Ohio, under Act of Congress, July 16, 1894.



Showing preparation of large tree for transplanting. The trench should be dug a year before transplanting and filled with rich soil. (See page 12.)

TRANSPLANTING

By V. H. Davis.

Transplanting is a necessary practice in connection with modern methods of cultivation as applied to many plants. It may be divided into three divisions or steps: lifting the plant, transferring it from its old to its new location, and replacing it in the soil. The first and second steps belong primarily to the nurseryman and plant grower, while the latter belongs primarily to the man who grows the plants for ornament or profit. It is the latter's problems to which this bulletin is devoted, but inasmuch as plant growing and crop growing are frequently combined, some phases of lifting and transportation will also be briefly discussed.

While the immediate result of transplanting is always to check growth, the ultimate results of proper and careful transplanting are usually beneficial. Transplanting makes possible a great saving of time and space in growing many crops. It also makes possible better care while the plants are young; a more compact and better branched root system is developed.

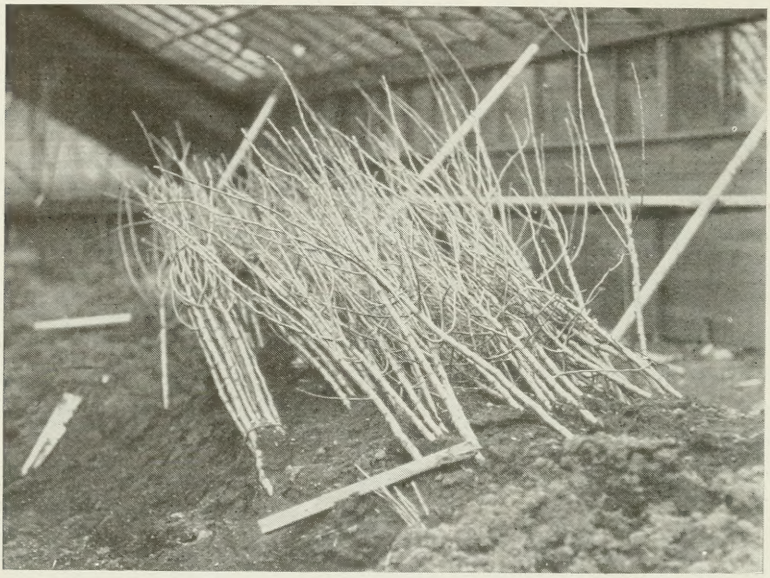
In spite of these advantages thousands upon thousands of trees and plants die annually as a result of improper transplanting and still other thousands are weakened and stunted beyond all hope of satisfactory and profitable recovery. These losses are the more deplorable because they can, in a great measure, be prevented. Occasional heavy losses will occur even where the most careful methods are employed.

For our present purpose, plants may be classed as **trees and shrubs** and **herbaceous plants.** Each class presents special problems from the standpoint of transplanting and will be considered separately.

TREES AND SHRUBS.

Trees and shrubs are perennials and require a period of years to come into their full value. The time element is consequently of more importance with them than with the annual, herbaceous plants in which the mistakes of one year may be corrected in the next.

First of all, the planter should have a definite idea of the kind of plant wanted and the purposes it is expected to fulfill. Strong, vigorous plants, free from insects and diseases, and typical of the kind should always be selected. A worthy variety should not be discarded because the plants are smaller than those of some other variety. It may naturally be a slow grower. When well cared for, the plants of average growth are generally better than very large or very small ones. Both diameter and height should be considered in selecting the grade to be purchased. A plant grown under crowded nursery conditions may be first class in height, yet very small in diameter and spindling in its habit of growth. Of the two dimensions, diameter is the more reliable. Generally speaking, the younger the plant the better it will withstand the transplanting process, the quicker it will recover, and in the end the more satisfactory will be the plant produced. This must be apparent for at least two reasons. In the first place, the older plant has sent its roots farther out into the soil and, when lifted, a much larger per cent. of the total root system remains in the soil.



"Heeled in" for the winter, tops slanting toward the south.

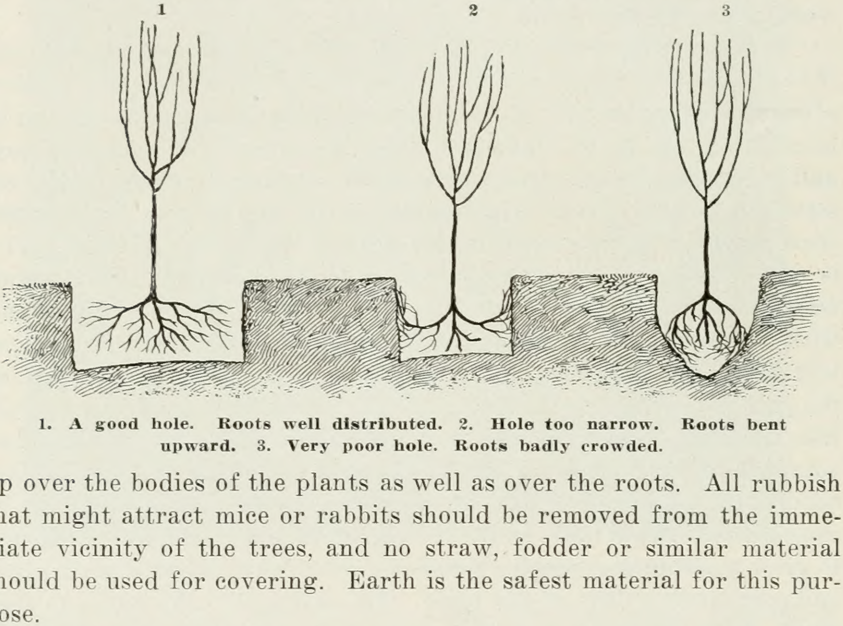
The roots cut will of necessity be larger and will renew themselves more slowly than will the smaller roots. There are cases where it is desirable to transplant older plants, but special and expensive precautions must be taken, which become greater as the age increases. This is especially applicable in ornamental plantings where immediate effects are desired, and where the normal growth is so slow that the transplanting of very young plants to their permanent location is not practical. Even here the best results in the end are usually secured by planting the younger plants when they can be given the proper care while very small.

The question as to the best time to transplant is still a disputed one among both nurserymen and planters. The question hinges largely on the latitude and the possibilities of winter injury. In this State, spring planting is safest and usually best, especially in heavy soils. It is always better to order plants in the fall of the year. Better stock will be secured and costly delays avoided. The plants may be ordered shipped in the fall and be "heeled in" at home over winter or the nurseryman may hold them until the following spring and ship as soon as the weather permits. The former method has many advantages and is generally more satisfactory where large numbers of plants are to be put out. It often happens that several weeks of splendid planting weather will be lost waiting for the spring shipment to arrive, while the fall-shipped trees will be on hand ready to be put out as soon as weather conditions permit.

It is generally better and safer to order from a local nurseryman, if he be reliable. The next best plan is to order from the larger grower, always insisting that the stock purchased be propagated and grown by himself, or that he tell exactly whence it comes. The man who buys and sells nursery stock should be avoided as well as tree agents who are strangers to the buyer. The temptation to buy up the "**cull stock**" from nurseries is too strong for all dealers and agents to resist. This is one of the most common sources of diseased and misnamed plants and usually no recourse is possible. It is rarely economy to buy plants with "guarantee of replacement" in case of loss. The nurseryman will charge enough to make himself safe and in case of proper care on the part of the planter, the chance of loss is small. If good, clean stock, free from insects and diseases, well grown and carefully handled is secured, the loss will depend directly upon the planting and the weather conditions, neither of which the nurseryman can control. It must be remembered that it takes years of experience and considerable expense to grow good nursery stock. Good stock is always worth a good price, and poor stock is dear at any price. The saving of a few cents on each plant, if the difference in price represents real quality, does not prove to be economical. This does not mean that the exorbitant prices sometimes charged for nursery stock are justifiable. Very often, exhorbitant prices go hand in hand with inferior or worthless stock. New varieties should never be set in large quantities until their value has been established.

All dormant plants should be packed in a manner that will prevent drying out. The roots should be covered with damp moss, and the entire top protected by burlap or straw. If plants are to be shipped any distance, they should be placed in boxes lined with paper, and all spaces should be filled with moss, straw, or other packing material. This work, of course, properly belongs to the nurseryman, but the planter should be watchful, and avoid those nurserymen who carelessly pack their plants for shipment.

A shipment of plants, immediately upon their receipt, should be unpacked and "heeled in" until planting, even if that is to be for a day or two only. This is done by digging or plowing a trench in a well drained place, preferably with a north exposure. The trench should be broad enough to receive the roots without bending or crowding them. The bundles should be cut and the plants spread out with tops pointing toward the south or southwest, and the roots covered with soil. If the plants are received in the fall and are to be held over winter, the trench should be 12 to 15 inches deep, and the earth banked up over the bodies of the plants as well as over the roots. All rubbish that might attract mice or rabbits should be removed from the immediate vicinity of the trees, and no straw, fodder or similar material should be used for covering. Earth is the safest material for this purpose.

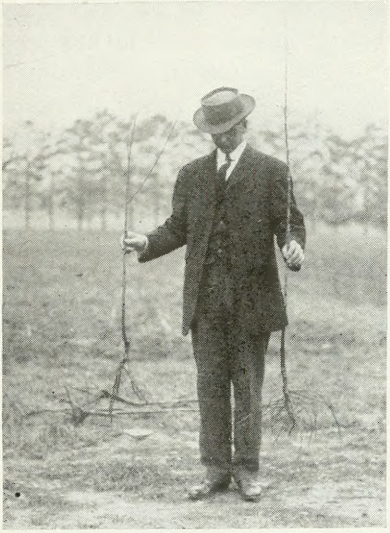


1. A good hole. Roots well distributed. 2. Hole too narrow. Roots bent upward. 3. Very poor hole. Roots badly crowded.

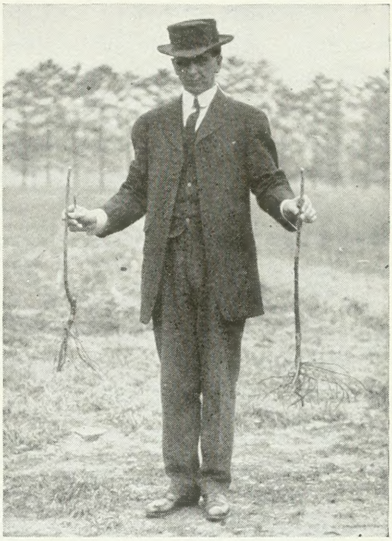
Planting is too often done on the impulse of the moment and in the rush to get plants started they are often placed in soils poorly prepared to receive them. The result is a slow, unsatisfactory growth for a number of years, or a permanent stunting of the plant. In the end, it is always best to have the soil in thorough condition before planting, even if it requires two or three years' time to do so. The site should be cleared of all stumps, stones and trash that will in any way interfere with the growth or care of the plants. This work can never be done as cheaply nor as thoroughly after the plants are set.

The soil should be thoroughly drained for all kinds of plants with the exception of a few ornamentals. There are few areas of any size where some spots will not be found in which water will stand too long; these spots should receive attention before planting.

The maintenance in the soil of the proper amount of organic matter is one of the chief problems of the cultivator, and one of the chief factors of plant growth. If this important material is lacking in a soil, it should be amply provided before planting by the application of manure and the turning under of green crops for two or three years.



One-year-old apple and peach from the nursery.



One-year-old apple and peach properly pruned for transplanting.

Digging the holes for the plants is an important part of transplanting. There are three common methods by which this work can be done, viz: Digging individual holes with the usual tools, making a furrow with a breaking plow, and making either individual holes or rows with dynamite. In any case, the holes should be dug large enough to receive the roots of the plants in their natural position, and from two to three inches deeper than they were found in the nursery. The poorer and harder the soil, the larger and deeper the holes should be. On land level enough to permit the use of the plow, this will be found a more rapid and better way than digging one hole at a time. Stakes should be set along the line of the row to act as guides, then with a plow and strong team a "round" as deep as possible should be plowed along this line. A second "round" should be made with a man on the beam or doubletree. This will make a ditch 12 to 15 inches deep, thoroughly breaking up the subsoil and putting it in excellent condition to receive the plants. The proper distance can now be measured along the trench and the loosed earth shoveled out sufficiently to receive the plant. The earth should be filled in and compacted about the roots to a distance of two feet on either side of the tree, and when the whole row is completed, one horse can be hitched to the breaking plow and the loose earth turned back into the trench, completing the work. This plan should never be used up and down any considerable slope on account of possible washing.

In relatively heavy and shaly soils, dynamite may be used to advantage. A hole should be driven or bored from 24 to 30 inches deep, and about one-half stick of 40 per cent dynamite placed in the bottom and discharged. The soil will be broken and cracked in all directions for several feet. Dynamiting may be done in the fall for spring planting, but the holes should never be dug very long before planting time. Otherwise, the soil may dry out to such an extent that watering becomes necessary and severe injury be done by placing this dry soil about the roots.

The pruning of the roots is necessarily a part of the transplanting process. With any practicable method of lifting plants, one-half or more of the root system is left behind in the soil; this is the portion most active in absorbing moisture and plant food. Root pruning at transplanting should be confined to the cutting away of all broken and mangled roots and bruised or broken ends. A root much longer than the rest should be cut back to correspond with the others for the sake of symmetry and ease in transplanting. The very fine fibrous roots are usually dead from drying and should be removed.

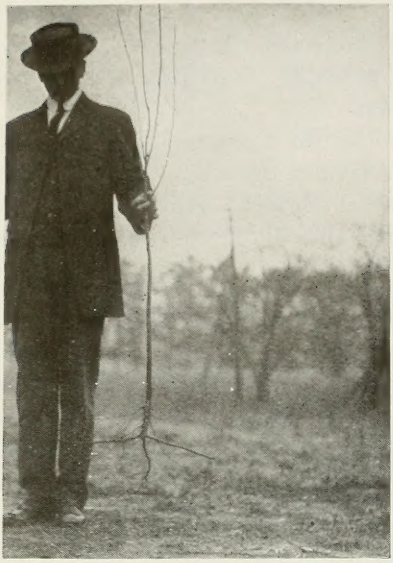
''Puddling'' of the roots is often practised by both the nurseryman and the planter. This consists of dipping the roots of the plants into a thick mud for the purpose of protecting them and creating a closer contact between soil and root at transplanting. This treatment is sometimes employed by nurserymen to cover up serious injury to the roots by exposure. Puddling properly done before the roots have become dried out may be beneficial and is never harmful, but its value is often overemphasized.

The injury which may be done to the roots by a few hours' exposure to the sun and wind at transplanting time is rarely ever appreciated; if it were, planters would not be so careless in this particular. The most practical way of protecting the roots at transplanting is to take the plants to the field with their roots completely immersed in a tank or barrel and remove them dripping as the location is ready to receive them. The plants may also be covered with wet straw or manure and removed as needed. Plants which have their tops seriously dried out may be greatly benefited by lying in water over night or by being entirely buried in the soil for a few days.

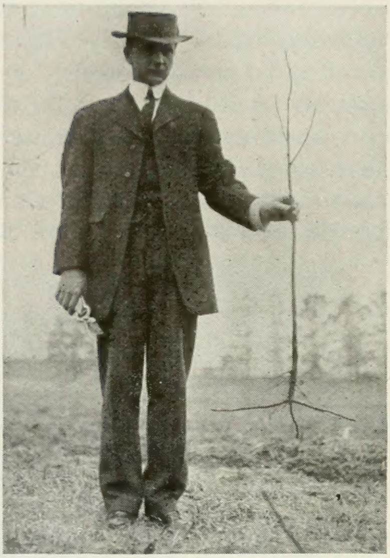
In filling in the soil around the roots, the top soil should be used first, worked and carefully compacted around the roots. At the same time the plant should be lifted and shaken slightly. This will have the tendency to direct the roots downward and fill in thoroughly under the crown. The dirt should be compacted into the hole until it is two-thirds or three-fourths full; the remainder of the soil should be left loose, so that it will act as a mulch to hold the moisture around the roots.

Pruning the top for an open center.

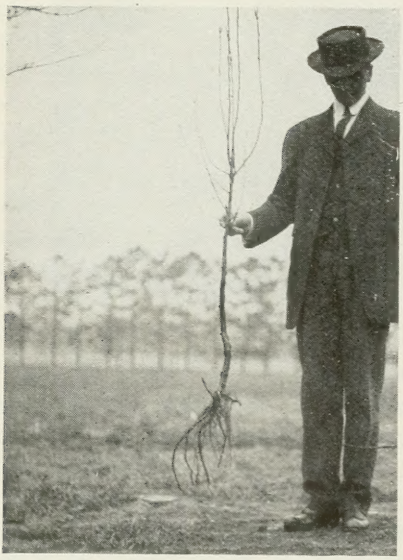
Watering will not usually be necessary, but in case it is, the soil should be compacted into the hole until it is two-thirds or three-fourths full, then watered copiously. One or two buckets of water to each plant should be used, and after the water has entirely disappeared the hole



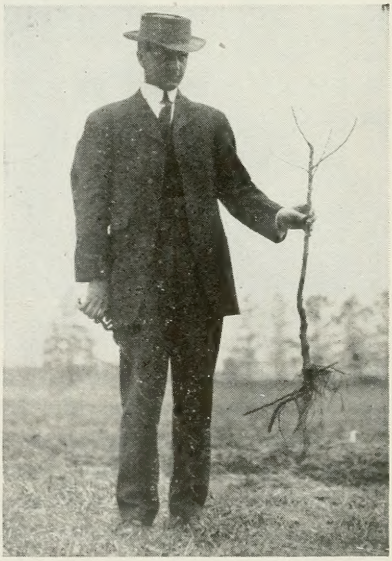
Two-year-old apple tree from the nursery.



Two-year-old apple tree pruned with a "leader" at transplanting.



Two-year-old apple tree from the nursery.



Two-year-old apple tree pruned for an open centered top at transplanting.

should be filled with loose soil. Watering during the summer months should be done at considerable intervals and then done thoroughly until the soil is completely saturated.

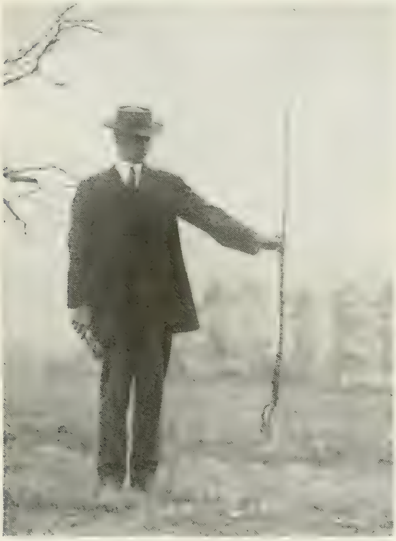
Immediately after transplanting is completed, the surface of the soil within a radius of two feet about the plant should be mulched with straw, manure, grass or hay, to the depth of three or four inches. No one thing at transplanting (with the possible exception of proper pruning) will save the life of more plants and start them into vigorous growth than thorough mulching. It conserves moisture, keeps the soil loose and mellow, well aeriated, and cool during the hot months. All of these conditions are favorable to the formation of new roots and the re-establishing of the root system in the soil.

Care should be used in the use of fertilizers and manures at transplanting. Strawy manures should never be placed in the bottom of the holes nor in direct contact with the roots. It is always best to apply manures to the surface of the soil about the plants, for the plant food will be slowly leached out and carried down to the roots, and at the same time the manure will be of value as a mulch. Commercial fertilizers should always be used carefully at transplanting and their application confined to the surface of the soil rather than placed directly in the hole. In any case, the fertilizer should not come in direct contact with the roots.

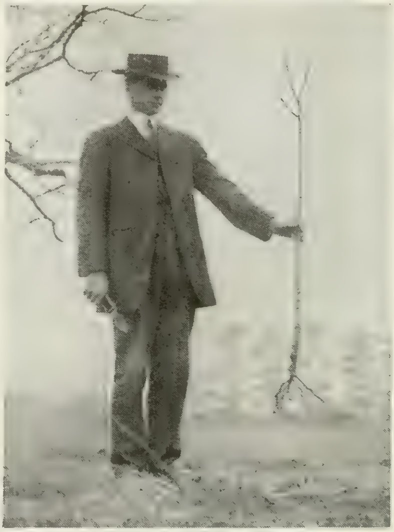
The pruning of the tops is properly a part of transplanting, but the various ways in which it may be done belong properly to the subject of pruning. As the plant grows in the nursery, there is a normal "balance" between the top and roots, but even by the most careful methods of lifting which are practicable, a very large proportion of the root system will be left behind in the soil. If the entire top is allowed to start into growth and develop leaves, moisture is lost by transpiration much more rapidly than the broken root system can supply it. Consequently, the plant growth is stunted and too often the plant dies outright. Perhaps more plants die or make a poor growth during their first season from a lack of proper cutting back at transplanting than from any other cause. The tendency is always to cut back too little rather than too much.

Trees from 4 to 24 inches in diameter can be successfully transplanted by employing special methods of preparation, protection and removal. Trees with a much branched root system can be transplanted more easily than those having a typical tap root. The plant must be removed with the largest possible amount of its root system. This is accomplished by the removal with the tree of a large ball of earth containing the roots undisturbed, or by digging and washing the soil away from the roots, carefully covering as fast as exposed until the whole plant can be lifted out of its old position. This lifting and hauling to the new location usually requires machinery built especially for the purpose. When the tree is put in the place prepared for it, the roots are spread out in their natural position and the soil carefully replaced and compacted about them. The top should be heavily pruned to reduce transpiration, and the whole plant should be tied in position by means of ropes or wires until the soil settles firmly and new roots start.

Trees from 4 to 10 inches in diameter can be very successfully transplanted by the following methods: The spring before the tree is to be transplanted, a trench 15 to 24 inches deep should be dug around the tree, leaving a ball of earth from 4 to 8 feet in diameter, depending on the size of the tree and the amount of earth which can be moved later with the tree. Good drainage must be provided and the trench filled with a rich compost. During the summer the cut roots will throw out numerous new roots into the rich compost and in the following spring the tree can be lifted with this mass of fibrous roots practically intact; these quickly re-establish themselves in a new position. Regular watering will usually be essential to the successful starting of large trees. Two or three lines of tile placed in position at transplanting leading well down under the roots will afford the most satisfactory method.



Two-year-old cherry tree from the nursery. Note the very high top. First branches should be about where hand is.



Two-year-old cherry tree pruned with open centered top at transplanting.

All evergreen plants require special care in transplanting because of the leaf surface exposure during the entire year. They should be lifted with a ball of earth which should be kept intact and the tops should be protected from the hot sun and direct winds. April and May are the preferable months for transplanting all evergreens. They should never be transplanted in the fall.

HERBACEOUS PLANTS.

Herbaceous plants are almost universally propagated from seeds grown in beds or flats especially prepared for this purpose. The seedlings are usually transplanted to other beds, providing additional space as the size increases, one to three times before the final transplanting. By this means, the best of care can be given and conditions made ideal for rapid growth. Strong, stocky plants with a compact and much branched root system result, which withstand the final transplanting to field conditions well. Plants which are spindly and soft will always suffer when removed to the field. If they have come from the hotbeds or greenhouse, they should be thoroughly hardened off by gradual exposure to outdoor conditions without checking their growth.

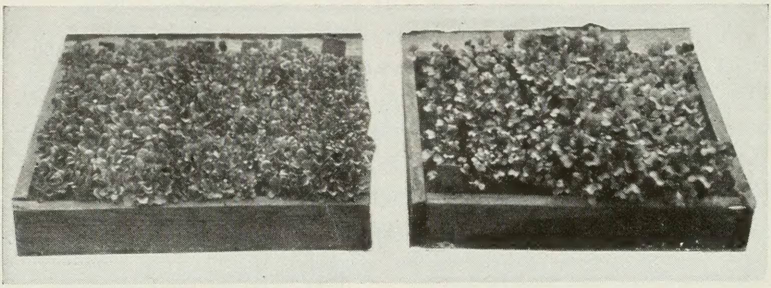
The soil should also be in prime condition, thoroughly and deeply fined and compacted. When possible, transplant in freshly turned soil. The ideal time to transplant is just before a rain or just after a rain, particularly if the weather continues cloudy. In any case, cool and cloudy days should be chosen if possible. In hot and dry weather, late afternoons and evenings should be selected.

In very dry seasons, the plants should be watered as they are transplanted. A dipper full of water about each plant will suffice. After the water soaks away, loose, dry earth should be drawn about the plant to prevent the soil from baking and the moisture from evaporating. In large operations, a tank on wheels may be drawn through the fields and the water carried to each plant by means of a hose. In small gardens it is practical to shade the plants for a day or two by means of a shingle placed in the ground in such a position as to cut off the sun during the middle of the day. Tin cans or any other ''shades'' which imprison the air about the plant and absorb a great deal of the sun's heat usually do much more harm than good.

While being transplanted, the plants should be kept out of the sun as much as possible and both the tops and roots kept wet. Plants should never be ''dropped'' much ahead of the planters. In lifting plants, the soil should be thoroughly wet and the plants removed by using the trowel or fingers under them as much as possible, thus breaking only the tips of the smallest roots. The practice of pressing a ball of the wet earth about the roots is a good one with loamy and sandy soils, but may do much harm if the soil is heavy clay by matting the roots together in a hard ball or clod from which they escape with difficulty.

Plants should be set deeper than they stood in the original bed. They will hold their position better and the roots will be in cool and moist earth. It is very important that the earth be pressed firmly about the roots and crown. Plants which have grown too long and spindly can often be transplanted successfully by opening a furrow, laying the plant in it and covering as much of the stem as desired, bending the leafy end into an upright position. Such plants often root all along the buried stem and develop an unusually large root system.

The best tool for making the openings in the soil is a dibbler, which makes a hole without removing the soil. This is made in various forms and sizes and the best form will depend largely upon the size and nature of the plant to be set. Of late years, transplanting machines drawn by horse power have come to be largely used for the planting of large areas of tomatoes, cabbage, etc. The machines not only do the work much more rapidly, but also much more thoroughly than it can be done by hand. This is especially apparent in dry, hard soil. The machine itself does not handle the plants. One man drives and two men or boys sit at the rear of the machine and drop the plants. A plow opens a narrow, deep furrow into which the plant is set. The plant is watered automatically and shoes or rollers follow, closing the furrow and compacting the earth about the roots. Plants can be set as close as one foot by quick work upon the part of the droppers.



Lettuce and cabbage seedlings ready for the first transplanting.

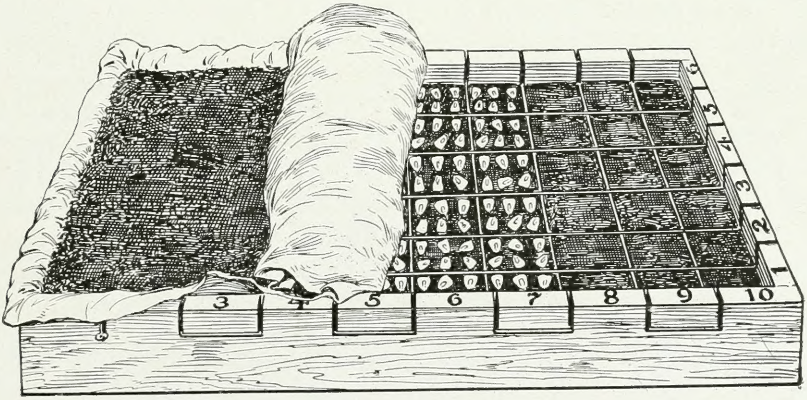
Melons, cucumbers and a few other plants cannot be transplanted readily. It is customary to start these in boxes, pots or inverted sods in the greenhouse or hotbeds. Various devices are used for the above purpose; old berry baskets, paper pots, 2- or 3-inch flower pots when they are also to be used for other purposes, old fruit cans from which tops and bottoms have been melted, held together with a tack or wire

If the plants are rather large, and particularly if they have not been transplanted before, a part of the foliage should be removed in order to lessen transpiration. One-half to one-third of the top may be removed with good results. The older leaves usually die off and a large amount of water is removed from the plant.

As soon as the plants are set cultivation should be started to form a dust mulch and conserve the soil moisture.

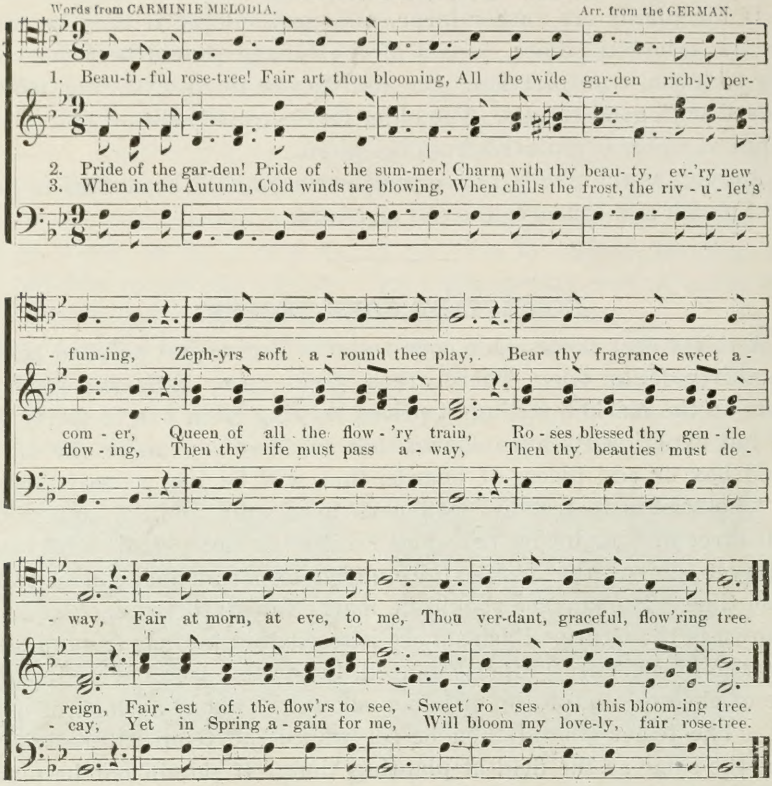
HOME-MADE CORN TESTER.

A thirty-cent home-made corn tester will give just as good results as a thirty-dollar one. There are a great many different kinds of testers on the market, selling at prices varying from five to thirty dollars, but experiments have shown that any boy can make one out of an old box or odd pieces of boards, that will be just as satisfactory. One who wishes to test his seed corn need only make a square box about three or four inches deep and fill it with moist sand. Of course, the larger the box the greater the number of ears which can be tested at one time. The surface should be marked off into two-inch squares, as shown in the figure. Each square is to contain kernels from one ear. After the kernels are properly placed, they should be covered with a piece of cheesecloth, on top of which should be about an inch of moist sand. The tester should then be set where the temperature will be about the same as the field at planting time. It should not be placed in a room having a temperature above 60 degrees. It is better if the tester is placed out of doors except during freezing weather. The idea is to approach field conditions as nearly as possible.



MY BEAUTIFUL ROSE-TREE.

Words from CARMINIE MELODIA. Arr. from the GERMAN.


1. Beau-ti-ful rose-tree! Fair art thou blooming, All the wide gar-den rich-ly per-
2. Pride of the gar-den! Pride of the sum-mer! Charm with thy beau-ty, ev-'ry new
3. When in the Autumn, Cold winds are blowing, When chills the frost, the riv-u-let's
-fum-ing, Zeph-yrs soft a-round thee play, Bear thy fragrance sweet a-
com-er, Queen of all the flow-'ry train, Ro-ses blessed thy gen-tle
flow-ing, Then thy life must pass a-way, Then thy beauties must de-
-way, Fair at morn, at eve, to me, Thou ver-dant, graceful, flow'ring tree.
reign, Fair-est of the flow'rs to see, Sweet ro-ses on this bloom-ing tree.
-cay, Yet in Spring a-gain for me, Will bloom my love-ly, fair rose-tree.

ANNOUNCEMENT.

The College of Agriculture of the Ohio State University, at the request of the Commissioner of Common Schools, Hon. Frank W. Miller, has arranged to offer work in agriculture in the summer Session for the benefit of the teachers of the common schools. This work will be conducted by a number of competent instructors, who will give courses along the following lines: Animal Husbandry, Farm Crops and Grain Judging, Horticulture, Dairying and Soil Fertility. This will be an excellent opportunity for the teachers to prepare for the teaching of agriculture, as well as for the examination which they will be required to take in preparation for the work of the year 1912-13.

The Session opens June 17 and continues eight weeks. The special Summer Session bulletin will be mailed on request.

Address W. E. Mann, University Editor, Columbus, Ohio.